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Myers

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(54) **MECHANICAL RIDE SIMULATOR**

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(21) Appl. No.: **14/068,211**

(22) Filed: **Oct. 31, 2013**

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(60) Provisional application No. 61/721,157, filed on Nov. 1, 2012.

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A63G 19/20 (2006.01)
A63G 13/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A63G 19/20*** (2013.01)

(58) **Field of Classification Search**
CPC A63G 13/00; A63G 13/08; A63G 19/02; A63B 22/001; A63B 26/003; A63B 69/00; A63B 69/04; A63B 2244/24; A61H 2201/1215; A61H 2201/163; A61H 2201/0406; A61H 2201/0431
USPC 472/95–97, 99, 102; 482/51; 434/247
See application file for complete search history.

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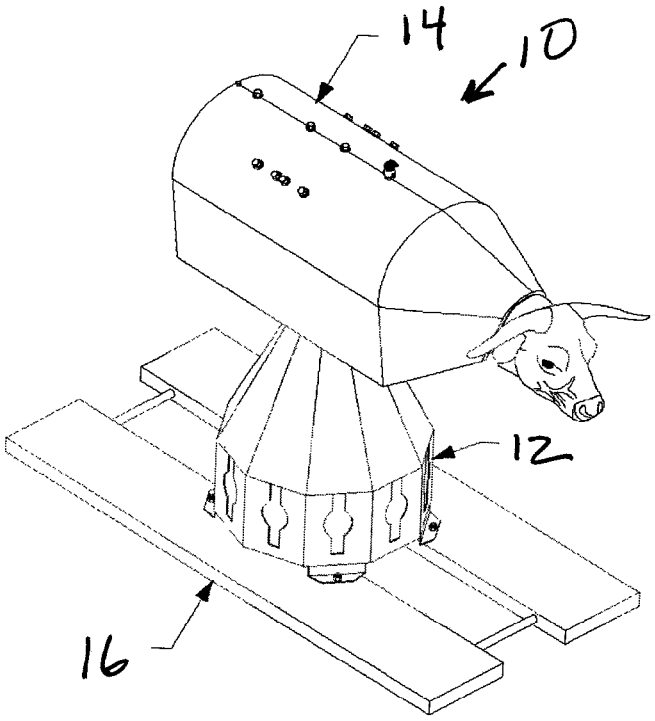
(57) **ABSTRACT**

A ride simulator having a body adapted for a rider, a base to mount the body, a motor to move the body, a pivot shaft to provide a connection between the body and the motor, a drive gear connected to the motor, a pivot gear that engages the drive gear and is rotated due to rotation of the drive gear. A movement assembly having a pivot shaft guide, a gear mount to mount the pivot shaft guide to the pivot gear, a mount bevel gear mounted inside the mount bearing and mounted to the pivot gear and a shaft bevel gear attached to a bottom end of the pivot shaft and engages the mount bevel gear so that the shaft bevel gear is rotated due movement of the mount bevel gear that moves with rotation of the pivot gear.

10 Claims, 9 Drawing Sheets



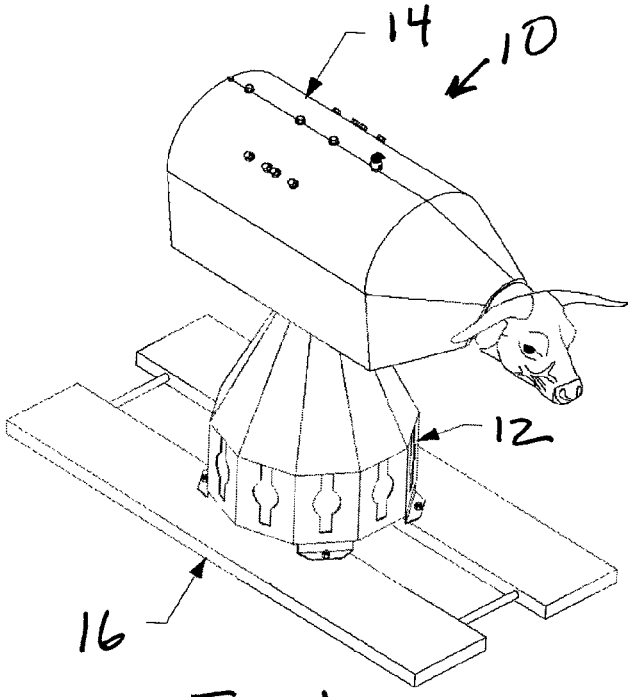


Fig 1

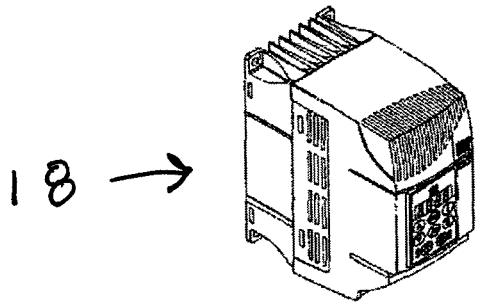
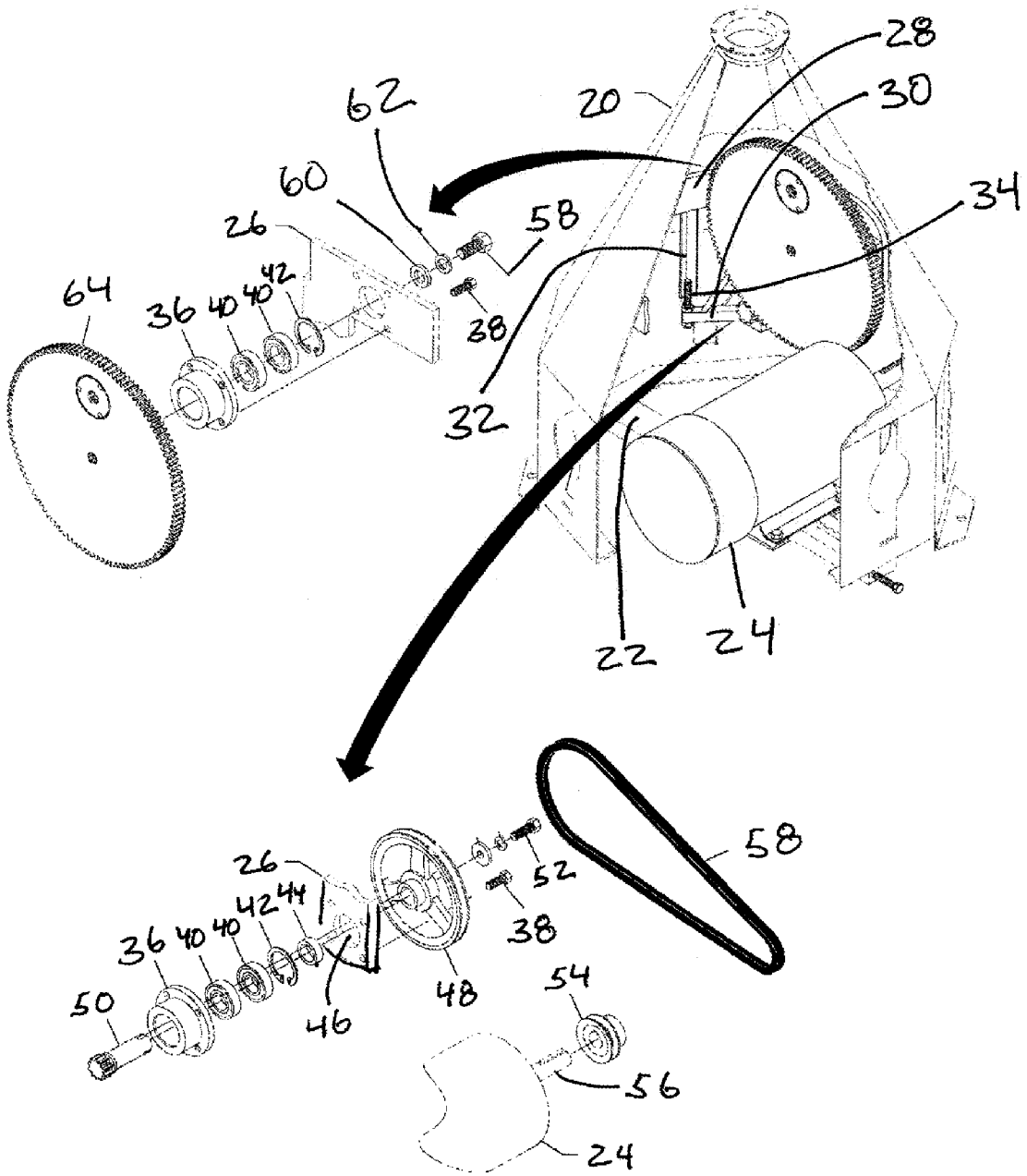


Fig. 2

Fig. 3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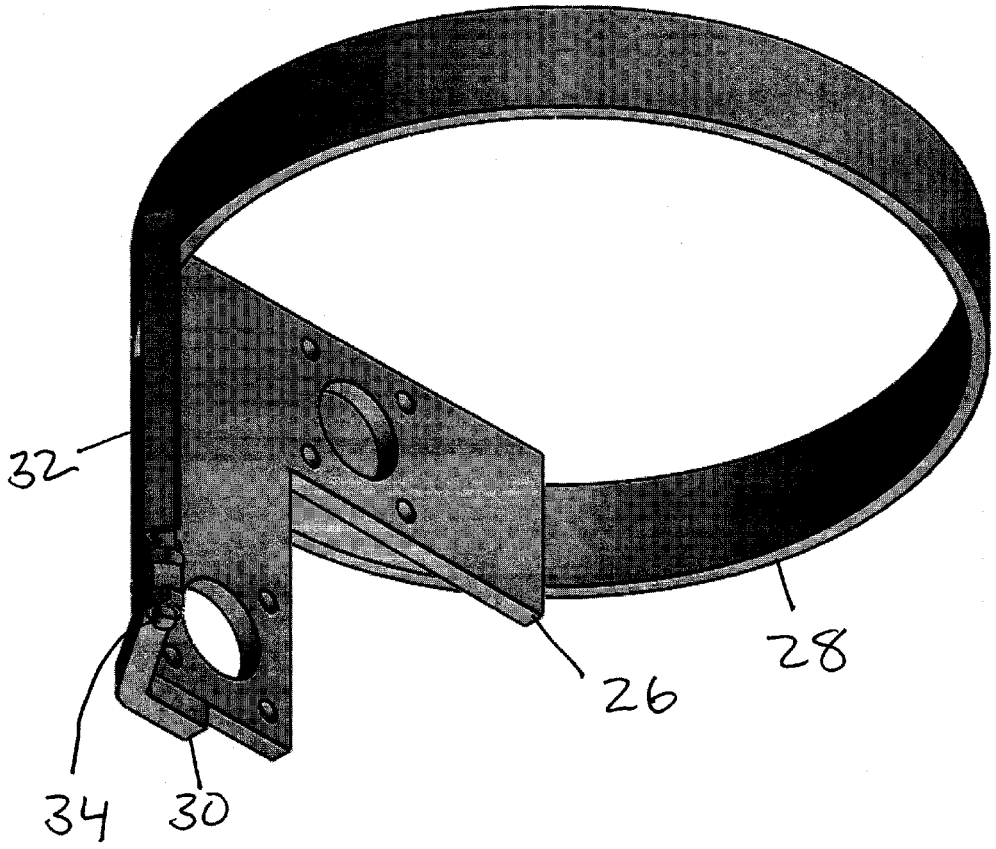

Fig. 4

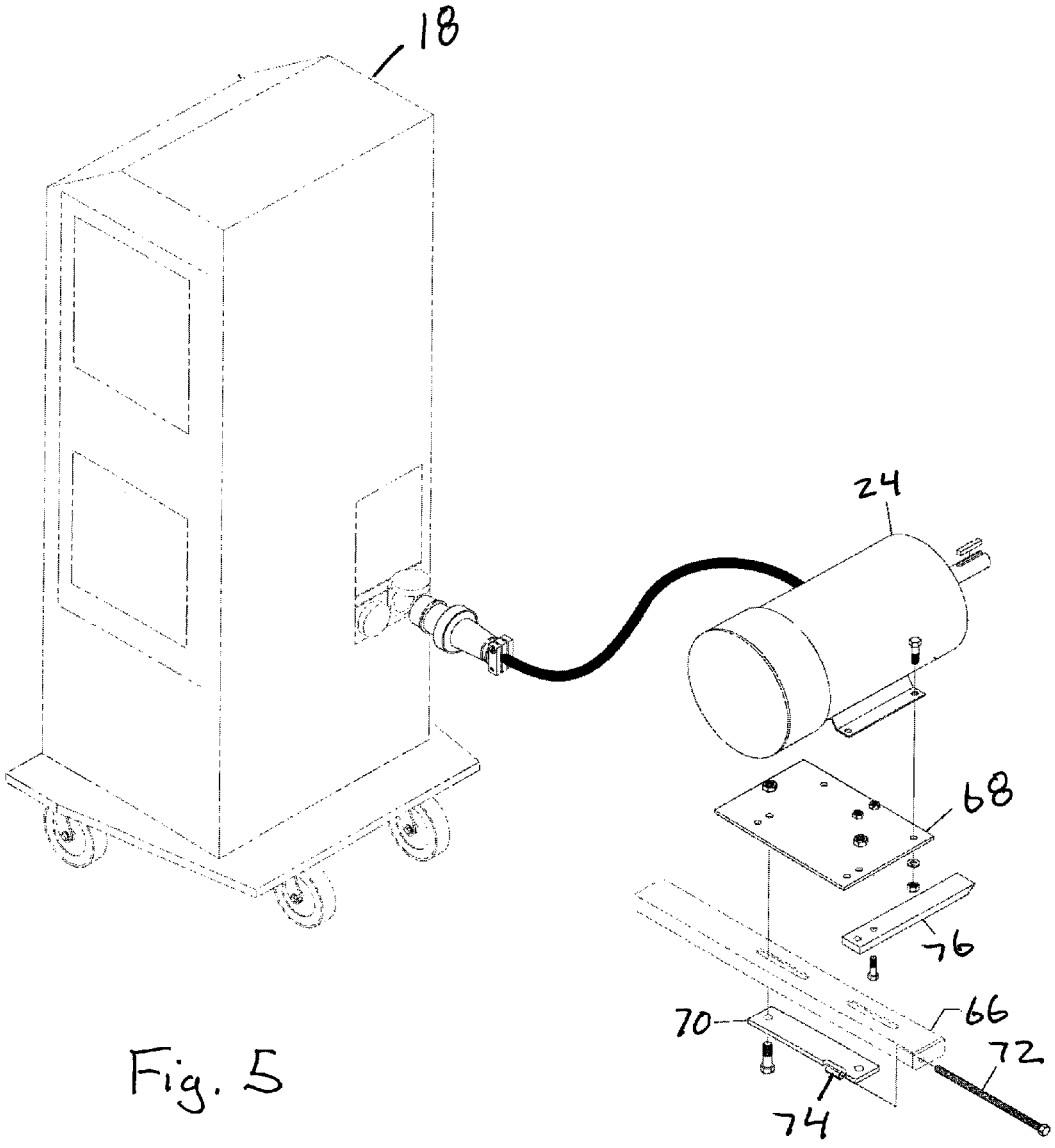

Fig. 5

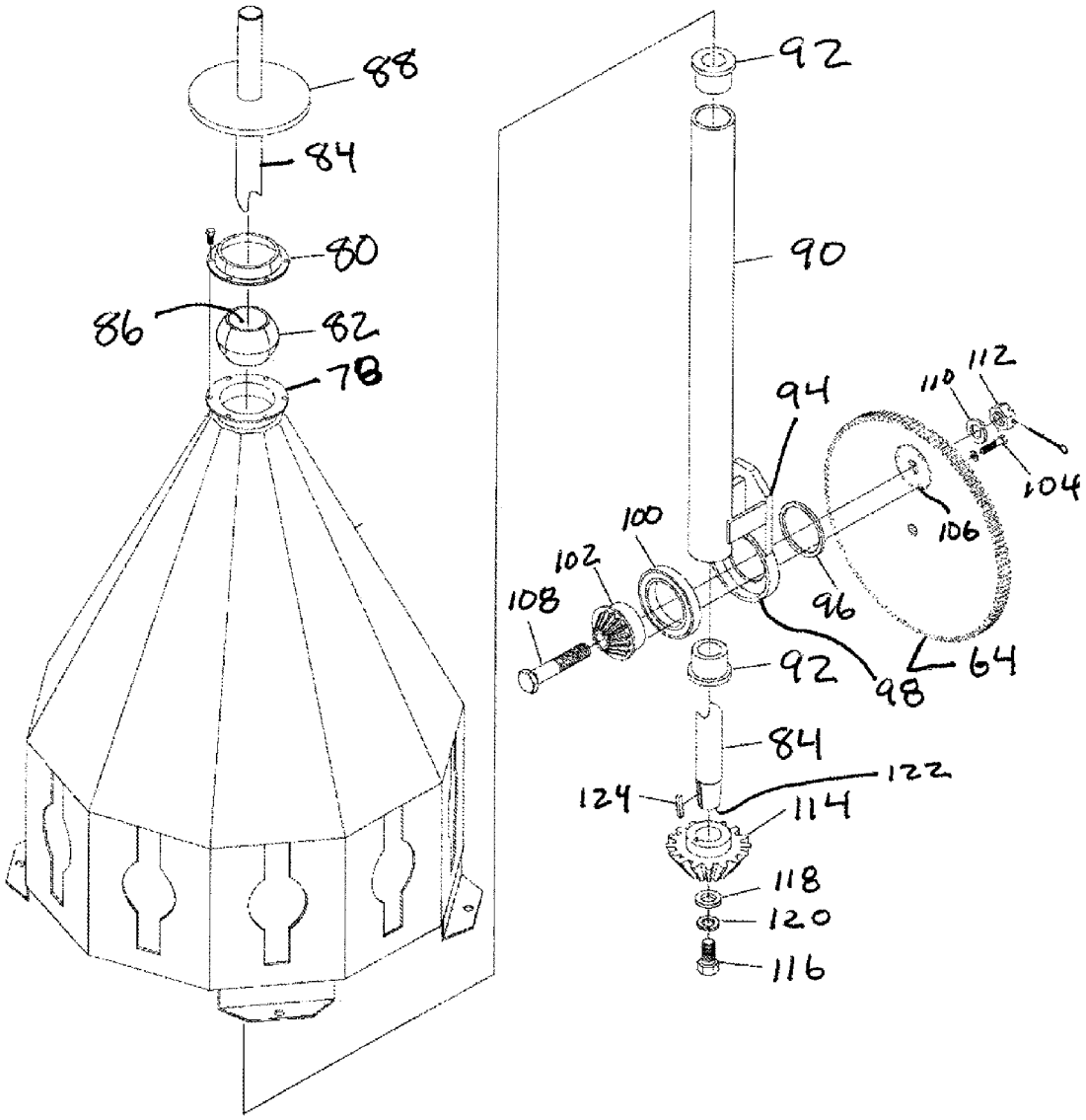
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Fig. 6

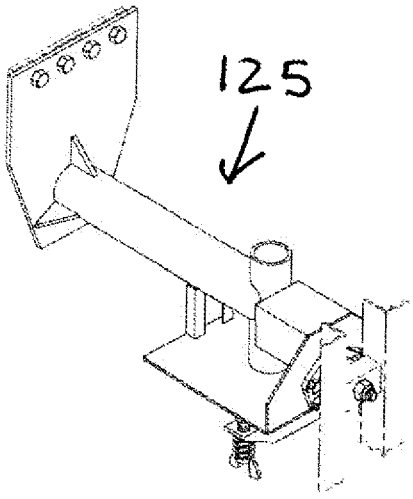

Fig. 7

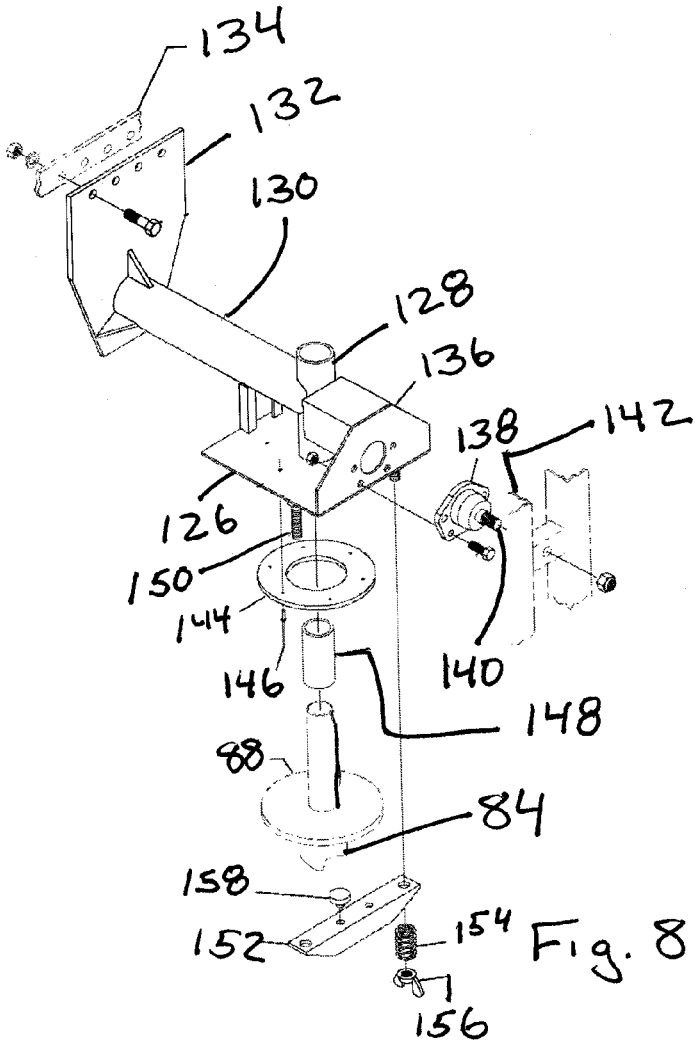
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Fig. 8

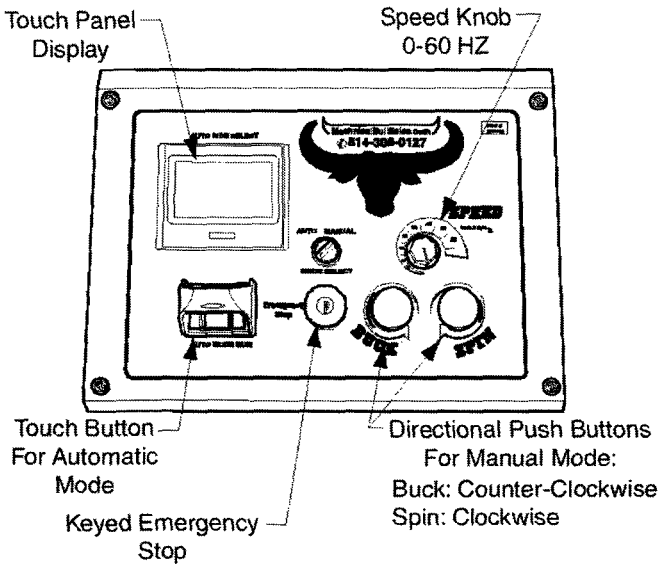
Touch Panel Display
Speed Knob 0-60 HZ
Touch Button For Automatic Mode
Keyed Emergency Stop
Directional Push Buttons For Manual Mode:
Buck: Counter-Clockwise
Spin: Clockwise

Fig. 9

MECHANICAL RIDE SIMULATOR

This application claims the benefit of and incorporates by reference U.S. Provisional Application No. 61/721,157 filed Nov. 1, 2012.

BACKGROUND

The present invention generally relates to simulators. More specifically, the present invention relates to simulator rides to simulate riding an animal.

Animal ride simulators have existed for decades for entertainment and are found in amusement parks, bars, restaurants, and clubs. The current animal ride simulators have strived to be realistic in the nature animal movements, if the animal had an unwanted rider. The current animal ride simulators have yet to reach the mark of total realism. The current animal ride simulators have a difficult time simulating when an animal will stop and change direction, due to the rate of speed the simulator must move and stop.

It is an object of the present invention to provide a mechanical ride simulator that simulates the natural movements of an animal stopping and changing direction to remove an unwanted rider.

SUMMARY OF THE INVENTION

A ride simulator having a body adapted for a rider, a base to mount the body, a motor to move the body, a pivot shaft to provide a connection between the body and the motor, a drive gear connected to the motor, a pivot gear that engages the drive gear and is rotated due to rotation of the drive gear. A movement assembly having a pivot shaft guide, a gear mount to mount the pivot shaft guide to the pivot gear, a mount bevel gear mounted inside the mount bearing and mounted to the pivot gear and a shaft bevel gear attached to a bottom end of the pivot shaft and engages the mount bevel gear so that the shaft bevel gear is rotated due movement of the mount bevel gear that moves with rotation of the pivot gear.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view of a mechanical ride simulator according to the present invention.

FIG. **2** is a perspective view of a control module according to the present invention.

FIG. **3** is a perspective exploded view of a base according to the present invention.

FIG. **4** is a perspective view of a gear mount according to the present invention.

FIG. **5** is a perspective exploded view of a motor and motor mount according to the present invention.

FIG. **6** is a perspective exploded view of a movement assembly according to the present invention.

FIG. **7** is a perspective view of an interface assembly according to the present invention.

FIG. **8** is a perspective exploded view of an interface assembly according to the present invention.

FIG. **9** is a schematic of a control panel according to the present invention.

DETAILED DESCRIPTION

The present invention is a mechanical ride simulator. The simulator as detailed below is particular suited for simulating the behavior of an animal that does not wish to be ridden by a person. FIG. **1** shows the simulator **10** which emulates a bull for bull riding. The simulator **10** includes a base **12** and a body **14** to represent an animal. The base **12** includes a platform **16** mounted to the base **12**. The platform **16** supports the base **12** on a surface where the simulator **10** is placed for use. FIG. **2** shows a control module **18** to activate the simulator **10** and control movements of the simulator **10**. FIG. **3** shows a cut-away of the base **12**. The base **12** includes an outer housing **20** to protect from interaction with the internal components of the simulator **10** that are mounted within the base **12**. There is a support framework **22** to support the internal components and the outer housing **20**. The outer housing **20** is fastened to the support framework **22**.

FIG. **3** shows the internal components as a drive gear assembly, pivot gear assembly and motor **24**. The drive gear assembly and the pivot gear assembly are attached to a gear mount plate **26**. The gear mount plate **26** is shown attached to ring support **28** in FIG. **4**. The ring support **28** is part of the support framework **22** as shown in FIG. **3**. FIG. **4** shows a horizontal support brace **30**, vertical support brace **32** and support bolt **34**. The vertical support brace **32** is mounted to the ring support **28**. The horizontal support brace **30** is mounted to the gear mount plate **26**. The support bolt **34** mounts to the horizontal support brace **30**. The interaction of the horizontal support brace **30**, vertical support brace **32** and support bolt **34** aids in preventing movement of the gear mount plate **26** due to torque experienced during operation of the simulator **10** from the different components.

The drive gear assembly includes a bearing housing **36** that mounts to one side of the gear mount plate **26** using bolts **38**. There are two bearings **40** that mount in the bearing housing **36** and are held in place by a snap ring **42**. A spacer **44** is shown for use in the shaft hole **46** of the gear mount plate **26**. A drive pulley **48** is mounted on the other side of the gear mount plate **26** and is directly fastened to a drive gear **50** using bolt **52**, so that when the drive pulley **48** rotates, the drive gear **50** rotates. The drive gear **50** has ten teeth. FIG. **3** shows a motor pulley **54** that mounts to a motor shaft **56** of the motor **24**. FIG. **3** shows a drive belt **58** that attaches between the motor pulley **54** and the drive pulley **48** for rotating the drive pulley **48** and the drive gear **50**. The drive pulley **48** is an eight inch pulley and the motor pulley **54** is a three inch pulley, giving the combination a 3 to 8 ratio. The pivot gear assembly includes a bearing housing **36** that mounts to one side the gear mount plate **26** using bolts **38**. There are two bearings **40** that mount in the bearing housing **36** and are held in place by a snap ring **42**. A gear bolt **58**, large heavy washer **60** and lock washer **62** secure a pivot gear **64** to the gear mount plate **26**, where the gear bolt **58** acts as a support shaft for the pivot gear **64**. The pivot gear **64** has one hundred and sixteen teeth, giving a 1 to 11.6 gear ratio between the drive gear **50** and pivot gear **64**.

FIG. **5** shows the control module **18** connected to the motor **24** to control the movement of the simulator **10**. FIG. **5** also shows a motor support **66** of the support framework **22**. The motor **24** mounts to a motor mount plate **68**. The motor mount plate **68** is mounted to the motor support **66**. A motor adjustment plate **70** is mounted between the motor mount plate **68** and the motor support **66**. A long bolt **72** travels through the motor support **66** and into a threaded channel **74** of the motor adjustment plate **68**. Movement of the bolt **72** moves the motor mount plate **68** along the motor support **66**. Also, a motor brace **76** is included that mounts to the motor mount plate **68** and rests on part of the support framework **22** to provide additional support of the motor **24**.

FIG. **6** shows a support collar **78** and a retention collar **80** mounted to the top of the base **12**. The retention collar **80** mounts to the support collar **78** trapping a pivot bearing **82** in

place. A pivot shaft **84** mounts through the pivot bearing **82** and enters the base **12**. The pivot bearing **82** is typically made from a plastic and is ball shape with a center hole **86** to receive the pivot shaft **84**. The ball shape of the pivot bearing **82** allows for the pivot shaft **84** to move around and at angles at the support collar **78**. The pivot shaft **84** includes a stop collar **88** to ride above the retention collar **80**. The pivot shaft **84** is used to support the body **14** of the simulator **10**. FIG. **6** shows additional internal components that are inside the base **12** that make up a movement assembly mounted to the pivot gear **64**. The movement assembly includes a tube as a pivot shaft guide **90** to receive the pivot shaft **84**. The pivot shaft guide **90** includes two bushings **92** for each end to guide the pivot shaft **84** and keep the pivot shaft **84** centered in the pivot shaft guide **90**. The pivot shaft guide **90** includes a gear mount **94** to allow mounting of the pivot shaft guide **90** to the pivot gear **64**. A spacer **96** is shown between the gear mount **94** and the pivot gear **64**. The gear mount **94** includes a bearing housing **98** to receiver a bearing **100**. A mount bevel gear **102** mounts inside the bearing **100**. The mount bevel gear **102** has 10 teeth. The mount bevel gear **102** is the attachment point between the gear mount **94** and the pivot gear **64**. Bolts **104** are inserted into the pivot gear **64** through holes **106**, then threaded into the rear of the mount bevel gear **102**. The gear mount **94** rotates about the mount bevel gear **102** using the bearing **100**, as the pivot gear **64** turns. A support bolt **108** runs through the center of the mount bevel gear **102** and the pivot gear **64** and is secured by the washer **110** and nut **112**. The support bolt **108** provides support for weight that will be placed on the mount bevel gear **102**. FIG. **6** shows the pivot shaft **84** extends beyond the pivot shaft guide **90** and is fastened to a shaft bevel gear **114**. The shaft bevel gear **114** has 18 teeth, giving a 1 to 1.8 gear ratio between the mount bevel gear **102** and the shaft bevel gear **114**. The shaft bevel gear **114** mounts to the pivot shaft **84** using a bolt **116**, washer **118** and lock washer **120**. The bolt **116** is inserted into the shaft bevel gear **114** and threaded into a gear end **122** of the pivot shaft **84**. A square key **124** is used to lock the shaft bevel gear **114** and the pivot shaft **84** together. The shaft bevel gear **114** and the mount bevel gear **102** mesh together to rotate the pivot shaft **84** as the pivot gear **64** rotates and causes the mount bevel gear **102** to rotate. The motor **24** and gearing shown in the base is elliptically based motion instead of just a pivoting motion in order to give the look and ride that the simulator **10** is bucking and kicking in a realistic manner.

FIG. **7** shows an interface assembly between the top of the pivot shaft **84** and the body **14** used to simulate an animal. FIG. **8** shows an exploded view of FIG. **7**. The interface assembly includes an interface plate **126**. Attached to the interface plate **126** is a pivot shaft receiver **128**. Extending from the pivot shaft receiver **128** and supported by the interface plate **126** is a cross bar **130**. The cross bar **130** includes a body attachment plate **132** for connection to a component **134** of the body **14**. The interface plate **126** includes a body support plate **136**. The body support plate **136** accepts the mounting of a ball joint assembly **138**. The ball joint assembly **138** includes a ball stud **140** extending from the covered ball (not shown). The ball stud **140** attaches to another component **142** of the body **14**. The ball joint assembly **138** allows for flexibility between the interface assembly and the body **14**. The interface assembly includes a spacer **144** attached with rivets **146** that lies between the interface plate **126** and the stop collar **88** of the pivot shaft **84**. The top of the pivot shaft **84** above the stop collar **88** is inserted into the pivot shaft receiver **128**. A bushing **148** is used in the pivot shaft receiver **128** between the inside of the pivot shaft receiver **128** and the outside of the pivot shaft **84**. The interface plate **126** includes two studs **150** for attachment of a hold down bracket **152** using springs **154** and wing nuts **156**. The hold down bracket **152** is mounted against the bottom of the stop collar **88** when mounted to the interface plate **126** to hold the interface assembly to the pivot shaft **84**. The hold down bracket **152** includes replaceable wear buttons **158** that contact the stop collar **88**. The springs **154** provide for flexibility during movement of the pivot shaft **84** and the interface assembly.

FIG. **9** shows a schematic of a control panel that connects to the control module **18** of FIGS. **2** and **5**. The control panel allows the user to control the speed of movement using a speed knob and direction of using the buck and spin control buttons. The speed and direction controls are used when the simulator is operated manually by a person. The control panel also includes software to allow the simulator to run automatically. The control module includes a variable frequency drive that is an adjustable-speed drive used to control the speed and torque of the motor by varying motor input frequency and voltage using the control panel. The motor **24** is a 230VAC, 3 phase, 60 Hz, 3 HP AC motor. The variable frequency drive is 3 HP. In manual mode the variable frequency drive is controlled by the speed potentiometer of the speed knob and directional pushbuttons for the buck and spin. The variable frequency drive controls motor direction, speed and torque. The motor includes a dynamic brake to provide a faster deceleration rate to the motor for producing faster and more controlled braking. If load inertia energy is greater than the energy delivered to the motor shaft, motor speed decreases. Negative torque is developed in the motor and the motor now acts as a generator converting output shaft mechanical power back to electrical energy. This power is returned to the variable frequency drive DC link element (capacitor or reactor). The simulator includes a braking DC chopper external to the variable frequency drive that transfers the energy to external resistors and dissipates the energy as heat. The control module includes cooling fans to prevent resistor overheating. The combination of the variable frequency drive and the dynamic brake allows for the simulation of stopping and changing direction of an animal.

While different embodiments of the invention have been described in detail herein, it will be appreciated by those skilled in the art that various modifications and alternatives to the embodiments could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements are illustrative only and are not limiting as to the scope of the invention that is to be given the full breadth of any and all equivalents thereof.

I claim:

1. A ride simulator comprising:

a body adapted for a rider;

a base to mount said body;

a motor to move said body, said motor mounted in said base;

a pivot shaft to provide a connection between said body and said motor;

a drive gear connected to said motor such that said motor rotates said drive gear;

a pivot gear that engages said drive gear and is rotated due to rotation of said drive gear; and

a movement assembly for connection of said pivot gear to said pivot shaft, said movement assembly comprising:

a pivot shaft guide to receive said pivot shaft

a gear mount to mount said pivot shaft guide to said pivot gear, said gear mount including a bearing housing with a mount bearing;

a mount bevel gear mounted inside said mount bearing, said mount bevel gear attached to said pivot gear in a non

rotational manner such that said gear mount moves about said mount bevel gear due to said mount bearing; and

a shaft bevel gear attached to a bottom end of said pivot shaft that extends beyond said pivot shaft guide and engages said mount bevel gear so that said shaft bevel gear is rotated due movement of said mount bevel gear that moves with rotation of said pivot gear.

2. The ride simulator of claim **1**, further including a ball shaped bearing at a top of said base, said ball shaped bearing including a through hole to allow said pivot shaft to pass through said ball shaped bearing.

3. The ride simulator of claim **1**, wherein a gear ratio between said drive gear and said pivot gear is 1 to 11.6.

4. The ride simulator of claim **1**, wherein said drive gear has 10 teeth and said pivot gear has 116 teeth.

5. The ride simulator of claim **1**, wherein a gear ratio between said shaft bevel gear and said mount gear is 1 to 1.8.

6. The ride simulator of claim **1**, wherein said shaft bevel gear has 10 teeth and said mount bevel gear has 18 teeth.

7. The ride simulator of claim **1**, further including a interface assembly between said pivot shaft and said body, said interface assembly comprising:

an interface plate

a pivot shaft receiver attached to said interface plate to receive said pivot shaft;

a cross bar extending from said pivot shaft receiver and supported by said interface plate, said cross bar including a body attachment plate for connection to said body;

a body support plate as part of said interface plate to accept mounting of a ball joint assembly, where said ball joint assembly includes a ball stud extending for attachment to said body;

at least two studs for attachment of a hold down bracket extending from said interface plate;

a hold down bracket mounted against a bottom of a stop collar of said pivot shaft and onto said at least two studs; and

a spring between said hold down bracket and a fastener on each of said studs.

8. The ride simulator of claim **1**, further including a control module connected to said motor, said control module including a variable frequency drive as an adjustable-speed drive to control speed and torque of said motor by varying motor input frequency and voltage.

9. The ride simulator of claim **1**, further including a control module connected to said motor, said control module including a dynamic brake to provide a faster deceleration rate to said motor for producing faster and more controlled braking.

10. The ride simulator of claim **8**, wherein said control module includes a dynamic brake to provide a faster deceleration rate to said motor for producing faster and more controlled braking.

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